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VALIDATION SUMMARY REPORT IBM 360/370 FORTRAN IV H.(U)
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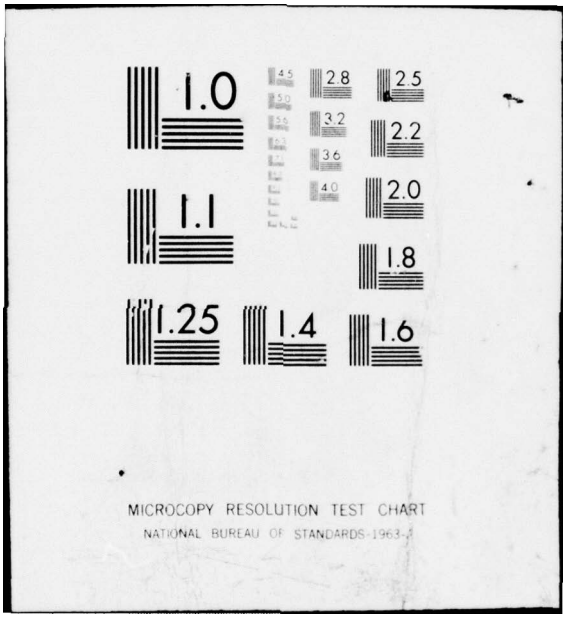
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FEDERAL COBOL COMPILER TESTING SERVICE

VALIDATION SUMMARY REPORT

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Department of the Navy
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Washington, D.C.
20376

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FCVS66-VSR205

FORTRAN COMPILER
VALIDATION SUMMARY REPORT

VALIDATION NUMBER FCVS66-VSR205

Prepared By:

FEDERAL COBOL COMPILER TESTING SERVICE
DEPARTMENT OF THE NAVY
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15. Supplementary Notes

16. Abstracts

This Validation Summary Report (VSR) for the IBM 360/370 'H' FORTRAN Compiler Version 21.8 (OS Version 21.8) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1966 FORTRAN Standard (X3.9-1966). The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies; a section relating the categories of discrepancies to the language; and a detailed listing of discrepancies together with the tests which were failed.

17. Key Words and Document Analysis. 17a. Descriptors

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Standards
Compilers
FORTRAN
Verifying
Proving Program Correctness
Software Engineering:

SAMPLE Underlined information must be provided for each VSR released to NTIS.

17b. Identifiers/Open-Ended Terms
FCVS
CVS

408438

17c. COSATI Field/Group 09/02

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Release unlimited	UNCLASSIFIED	
	20. Security Class (This Page) UNCLASSIFIED	22. Price

FCVS66-VSR205

FORTRAN COMPILER VALIDATION

1.	Validation Number	FCVS66-VSR205
2.	Vendor	International Business Machines
3.	Mainframe	IBM System 360/65
4.	Compiler Identification	FORTRAN IV H Level 21.8
5.	Operating System Identification	OS 21.8 MVT WITH HASP 3.1
6.	Compiler Validation System Version Number	FCVS66 1.2

*PLEASE NOTE. The Department of the Navy may make full and free public disclosure of the Validation Summary Report (VSR) in accordance with the "Freedom of Information Act" (5 U.S.C. #552). The results of this validation are only for the purpose of satisfying United States Government requirements, and apply only to the Computer System, Operating System release, and compiler version identified in the VSR. The FORTRAN Compiler Validation System is used to determine, insofar as is practical, the degree to which the subject compiler conforms to American Standard FORTRAN, X3.9-1966. Thus, the VSR is necessarily discretionary and judgmental. The United States Government does not represent or warrant that the statements, or any one of them, set forth in the VSR are accurate or complete. The VSR is not meant to be used for the purpose of publicizing the findings summarized therein.

For information concerning this compiler you can contact the vendor's designated representative named below:

Jay Valentine
Federal Support Center
IBM Corporation
10401 Fernwood Road
Bethesda, Maryland 20034

TABLE OF CONTENTS

SECTION 1. INTRODUCTION

1.1 Purpose of the Validation Summary Report

The purpose of the Validation Summary Report (VSR) is to identify individual FORTRAN language elements whose implementation does not conform to the language specifications defined in American Standard FORTRAN, X3.9-1966.

1.2 Preparation of the VSR

The Validation Summary Report is prepared by analyzing the results of running the FORTRAN Compiler Validation System (FCVS). The FORTRAN Compiler Validation System consists of audit routines containing features of American Standard FORTRAN, their related data, and an Executive Routine which prepares the audit routines for compilation. Each audit routine is a FORTRAN program which includes many tests and supporting procedures indicating the result of the tests.

The testing of a compiler in a particular hardware/operating system environment is accomplished by compiling and executing each audit routine. The report produced by each routine tells whether the compiler passed or failed the tests in the routine. If the compiler rejects some language elements by terminating compilation, giving fatal diagnostic messages, or terminating execution abnormally, then the test containing the code the compiler was unable to process is deleted. The audit routine is compiled again and execution is repeated.

The compilation listings and the output reports of the audit routines constitute the raw data from which the members of the Federal COBOL Compiler Testing Service produce a Validation Summary Report.

1.3 Organization of the VSR

The Validation Summary Report is made up of several sections whose contents are described below.

a. Section 2 summarizes the results of the compilation and execution of the programs comprising the FORTRAN Compiler Validation System. Section 2 is divided into a subsection describing the syntax errors encountered while compiling the FORTRAN audit routines, and a subsection describing the semantic errors which occurred during execution of the FORTRAN audit routines.

b. Section 3 contains information which describes the software environment in which the compiler was tested. This includes the name and version of the operating system and the logical unit/physical device assignments used in the programs comprising the FCVS. The options used with the compiler are also given, and if applicable, the use of compiler optimization features is explained.

c. Appendix A is the Validation Summary Working Document, a working paper resulting from the compilation and execution of the FCVS. The body

of the VSR is derived from Appendix A.

1.4. Use of the VSR

The Department of the Navy may make full and free public disclosure of the Validation Summary Report (VSR) in accordance with the "Freedom of Information Act" (5 U.S.C. #552). The results of the validation are only for the purposes of satisfying United States Government requirements, and apply only to the computer system, operating system release, and compiler version identified in the VSR.

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1.5 Sources of Additional Information

The detailed FORTRAN language specifications are given in the publication "American Standard FORTRAN, X3.9-1966", available from the American National Standards Institute, 1430 Broadway, New York, New York 10018.

An explanation of the FORTRAN Compiler Validation System is contained in the FCVS User's Guide. This document explains how to run the compiler validation system. The User's Guide and a magnetic tape containing a copy of the FCVS programs are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia, 22151. (Ordering information can be obtained from the Federal COBOL Compiler Testing Service.)

SECTION 2. DETAILED EVALUATION OF ERRORS.

This section summarizes the results of the compilation and execution of the programs comprising the FORTRAN Compiler Validation System (FCVS). The version of the FCVS used during this validation is shown inside the front cover of the VSR.

Section 2 is made up of two subsections. The first subsection describes each syntax error encountered during compilation of the audit routines, and the second subsection describes the semantic errors encountered during execution of the audit routines.

Each error or deviation noted in this section makes reference to an audit routine named in Appendix A (Validation Summary Working Document). This reference provides the documented results of an occurrence of errors/deviations detected during the running of the FCVS using the compiler within the environment identified in this document. The Validation Summary Working Document is presented in sequence by audit routine name.

2.1 Syntactical Errors

No syntactical errors occurred during compilation of the FCVS audit routines.

2.2 Semantic Errors

2.2.1 An assigned GO TO test resulted in incorrect branching for the GO TO statement when the 01 (OPT=01) compiler optimization option was used. See FM013.

2.2.2 A test of an ASSIGN statement in conjunction with the normal arithmetic assignment statement caused the program to stop executing when the 02 (OPT=02) compiler optimization option was used. See FM013.

X3.9-1966 References: Section 7.1.1.3, GO TO Assignment Statements
Section 7.1.2.1.2, Assigned GO TO Statement

SECTION 3. SOFTWARE ENVIRONMENT.

The compiler referenced in this document was validated using the software environment described in this section. When using a modification of the described environment, the compiler may or may not continue to conform to the Standard. It should be noted that during the validation process, an attempt is made to validate as many different options as possible.

The use of compiler options, logical unit/physical device assignments, and any form of optimization which is not described in this report could cause the compiler to produce a program that does not perform according to the specifications of Standard FORTRAN. Only the environment described in this document has been used with this compiler to satisfy the validation requirements of the Department of the Navy.

1. Options or parameters used on the processor call statement for the compiler.

Options specified:

a. Batch - Without Optimization.

The processor call statement which was used is

```
//STEP EXEC FORTHCL,PARM.FORT='OPT=0'.
```

The options which were used by the compiler are NAME=MAIN, OPT=00, LINELNT=50, SIZE=0000K, SOURCE, EBCDIC, NOLIST, NODECK, LOAD, MAP, NOEDIT, NOID, NOXREF.

b. Batch - With OPT=01.

The processor call statement which was used is

```
//STEP EXEC FORTHCL,PARM.FORT='OPT=1'.
```

The options which were used by the compiler are the same as a. above except the OPT option was set to 01(OPT=01).

c. Batch - With OPT=02.

The processor call statement which was used is

```
//STEP EXEC FORTHCL,PARM.FORT='OPT=2'.
```

The options which were used by the compiler are the same as a. above except the OPT option was set to 02(OPT=02).

d. Time-sharing.

The time-sharing processing mode was not used in validating this compiler.

2. Logical Unit/Physical Device Assignments.

a. Batch Compiler Runs.

Printer Destined Files:

Logical unit 06 was assigned to SYSOUT=A.

Tape Files:

Logical unit 07 was assigned to a tape file by using the following JCL card

```
//FT07F001 DD DSN=T01,UNIT=2400,DISP=(,KEEP),DCB=(BLKSIZE=110,RECFM=U)
```

Sequential Mass-storage Files:

Logical unit 07 was assigned to a mass-storage file by using the following JCL card

```
//FT07F001 DD UNIT=3330,SPACE=(CYL,(2,1)),DCB=(BLKSIZE=110,RECFM=U)
```

Card Input Files:

Logical unit 05 was assigned to the card reader. The following JCL card precedes the audit routine data

```
//FT05F001  DD *
```

b. Time-sharing Compiler Runs.

The time-sharing processing mode was not used in validating this compiler.

3. Optimization. The compiler may or may not have optimization features. If there was an optimization feature available, it was used during the validation process (during a separate execution of the Compiler Validation System) to determine if its use causes the compiler to produce a program which does not give the expected results. If the optimization is invoked through the compiler call statement then it is mentioned in paragraph 1 above. If it is invoked through the introduction of a compiler directing source program statement, it is shown below. Optimization which would require modification to source program statments is not considered in this report in that it is beyond the scope of the use of Standard FORTRAN and the validation process.

The optimization feature for this compiler is invoked through the compiler call statement. See 1. above.

4. Compiler.

FORTRAN IV H, level 21.8

5. Operating system.

   OS Version 21.8, MVT with HASP 3.1

6. Computer System Reference Manuals

   a. IBM System 360 and System 370, FORTRAN IV Language, May 1974, Publication Number GC28-6515-10.

   b. IBM System/360 Operating System FORTRAN IV (G&H) Programmers Guide, June 1970, Publication Number GC28-6817-2.

APPENDIX A

VALIDATION SUMMARY WORKING DOCUMENT

This appendix is a working paper produced during the validation and documents the results of the compilation and execution of each of the programs comprising the FCVS. The results contained herein are based on the use of the compiler within the Validation Environment identified in this appendix. This appendix (Validation Summary Working Document) is not part of the official Validation Summary Report (VSR), and it is not intended to reflect in any way the compiler's usefulness or degree of conformance to the language specifications.

The reader of this appendix should keep in mind that the same problem area may appear in more than one program but is considered only as a single discrepancy, and the problem is reflected only once in the body of the VSR. (The VSR will in turn only reference the first occurrence of the problem in the appendix.)

This appendix is divided into four parts. The first part describes the Validation Environment. The second part lists the Monitor Input Cards used in creating a job control stream for execution in the batch mode. The third part shows the control cards required to compile and execute an individual program. The fourth part of the document is divided into two categories of information: compilation results and execution results. Information items, such as compiler warning messages, are included in the summary of compilation and execution results.

The reference document for FORTRAN is American Standard FORTRAN, X3.9-1966.

VALIDATION ENVIRONMENT

COMPILER IDENTIFICATION:	FORTRAN IV H, Level 21.8
COMPUTER SYSTEM:	IBM System 360/65
OPERATING SYSTEM:	OS 21.8, MVT with HASP 3.1

Each of the programs comprising the FCVS was compiled and executed three times in the batch mode. First, the programs were compiled and executed without the compiler optimization feature, second the programs were compiled and executed with the compiler optimization feature 'OPT=01' requested, and last the programs were compiled and executed with the compiler optimization feature 'OPT=02' requested. In addition, the programs which test I/O, FM100 through FM108, were run with the output logical unit assigned to a tape device, and then rerun with the output logical unit assigned to a mass-storage device.

CCVS EXECUTIVE CONTROL CARDS

The CCVS Executive Routine was used to prepare the FCVS programs for execution in the batch mode. The Control Cards used as input to the CCVS Executive Routine together with the job control stream for executing the Executive Routine are listed below:

```
//VALIDATE3 JOB (190602,4A00),'MIKE O CUNNINGHAM',CLASS=G,REGION=150K
//EXEC VALIDATE
//STEP1.SYSIN DD *
*DATE 033177
*INITIAL ALL
B-0103J//XXXXX JOB (190602,4A00),'FORTRANH OPT1',CLASS=G
B-02  S//STEPX EXEC PGM=IEBGENER
B-03  S//SYSPRINT DD SYSOUT=A
B-04  S//SYSUT1 DD *,DCB=(LRECL=80,BLKSIZE=80,RECFM=F)
B-0519S INCLUDE SYSLMOD(XXXXX)
B-06   //SYSUT2 DD DSN=VALIDATE.CONTROL,DISP=OLD
B-07  T//SYSUT2 DD DSN=VALIDATE.CONTROL,DISP=MOD
B-08  S//SYSIN DD DUMMY
B-0907S//STEP9  EXEC FORTHCL,PARM.FORT='OPT=1'
B-10  S//FORT.SYSIN DD *
B-11
E-0137S//LKED.SYSLMOD DD DSN=VALIDATE.LOAD(XXXXX),
E-02  S// DISP=SHR
E-03  J//LINK EXEC PGM=IEWL,REGION=150K,
E-04  J//    PARM='XREF,LIST,LET,NCAL'
E-05  J//SYSPRINT DD SYSOUT=A
E-06  J//SYSUT1 DD UNIT=SYSWRK,SPACE=(CYL,(10,5))
E-0733J//SYSLMOD DD DSN=VALIDATE.LOAD(XXXXX),DISP=SHR
E-08  J//SYSLIN DD DSN=VALIDATE.CONTROL,DISP=SHR
E-0921J//STEPLAST EXEC PGM=XXXXX,REGION=100K
E-10  J//STEPLIB DD DSN=VALIDATE.LOAD,DISP=SHR
E-11  JBREAK***
E-13  J//FT06F001 DD SYSOUT=A
E-14  J//FT05F001 DD *
E-15  J/*
E-16
E-12  J//FT07F001 DD UNIT=3330,SPACE=(CYL,(2,1)),DCB=(BLKSIZE=110,RECFM=U)
E-12  J//FT07F001 DD DSN=T01,UNIT=2400,DISP=(,KEEP),DCB=(BLKSIZE=110,RECFM=U)

(FORTRAN audit routine selection cards)

*BCD-POP YES
*CCVSVR 74
*LIST UPDATES,XCARDS,CTL,JCL
*PRGID
*END-MONITOR
*BEGIN-UPDATE
*END-UPDATE
/*
/*
```

FCVS66-VSR205

```
//STEP2 EXEC SCHEDULE
//STEPZ.EQUE DD UNIT=(3330,3),SPACE=(CYL,(30,2))
//BJCL DD DSN=VALIDATE.READER,DISP=OLD
/*
```

CONTROL CARDS FOR RUNNING FCVS PROGRAMS

The job control stream for an individual program consisted of the following control cards:

```
//FM100 JOB (190602,4A00),'FORTRANH OPT1',CLASS=G
//STEPX EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSUT1 DD *,DCB=(LRECL=80,BLKSIZE=80,RECFM=F)
 INCLUDE SYSLMOD(FM100)
//SYSUT2 DD DSN=VALIDATE.CONTROL,DISP=OLD
//SYSIN DD DUMMY
//STEP001 EXEC FORTHCL,PARM.FORT='OPT=1'
//FORT.SYSIN DD *

(audit routine source program)

//LKED.SYSLMOD DD DSN=VALIDATE.LOAD(FM100),
// DISP=SHR
//LINK EXEC PGM=IEWL,REGION=150K,
//    PARM='XREF,LIST,LET,NCAL'
//SYSPRINT DD SYSOUT=A
//SYSUT1 DD UNIT=SYSWRK,SPACE=(CYL,(10,5))
//SYSLMOD  DD DSN=VALIDATE.LOAD(FM100),DISP=SHR
//SYSLIN DD DSN=VALIDATE.CONTROL,DISP=SHR
//STEPLAST EXEC PGM=FM100,REGION=100K
//STEPLIB DD DSN=VALIDATE.LOAD,DISP=SHR
//FT07F001 DD DSN=T01,UNIT=2400,DISP=(,KEEP),DCB=(BLKSIZE=110,RECFM=U)
//FT06F001 DD SYSOUT=A
//FT05F001 DD *
/*
```

RUN SUMMARIES

FM001 through FM002

A. Compilation

No errors.

B. Execution

No errors.

FM003

A. Compilation

The compiler issued messages of the type

ISN (number) IEK208I 04 THE CONTINUE STATEMENT DOES NOT HAVE A STATEMENT NUMBER

for those CONTINUE statements which did not include a statement number.

B. Execution

No errors.

FM004 through FM011

A. Compilation

No errors.

B. Execution

No errors.

FM012

A. Compilation

When the compiler optimization feature defined in the compiler parameter as "OPT=02" is used the following compile time message was issued

LABEL 001142 IEK610I 04 THE STATEMENT NUMBER OR GENERATED LABEL IS UNREACHABLE.

FCVS66-VSR205

This message occurred for Test 114 which contains an unconditional branch out of the range of a DO using a GO TO statement. The source code is

```
        DO 1142 M=1,10
        GO TO 1143
   1142 CONTINUE
   1143 CONTINUE
```

This message was not issued when the compiler option was "OPT=01" or "OPT=00".

B. Execution

No errors.

FM013

A. Compilation

No errors.

B. Execution

1. When the compiler optimization option was set to "OPT=01" test number 126 failed. The ASSIGNED GO TO feature is tested by the following statements

```
ASSIGN 1263 TO I
GO TO I, (1262,1263,1264)

Computed result = 1262
Expected result = 1263
```

2. When the compiler optimization option was set to "OPT=02" program execution terminated with the message

```
IHC240I STAE-ABEND CODE IS;
    SYSTEM 00C1, USER 0000.  IO - NONE
    . SCB=0D4458.  PSW IS FEB5000D4
    0040004.
```

The execution-time message occurred before the results of Test 129 were printed. Test 129 tests the ASSIGN statement in conjunction with the normal arithmetic assignment statement by use of the following FORTRAN statements

```
ASSIGN 1292 TO L
L = 1293
ASSIGN 1294 TO L
GO TO L, (1294,1293,1292)
```

FM014

A. Compilation

No errors.

B. Execution

No errors.

FM015

A. Compilation

The compiler issued messages on the variable HADN11, HADN12, HADN13, HADN14 and HADN15 stating that "the DATA statement contains a variable that is not referenced".

B. Execution

1. The FORTRAN statement STOP 0247 produced the message "IHC002I STOP 247".

2. The FORTRAN statement PAUSE 0123 produced the message "IHC001A PAUSE 123".

The above results are not considered errors and are included for completeness only. For the PAUSE statement the FORTRAN Standard states, "at the time of cessation of execution, the octal digit string is accessible".

FM016 through FM019

A. Compilation

No errors.

B. Execution

No errors.

FM020

A. Compilation

The FORTRAN statements

```
IFON01(IDON01) = 32767
LFTN01(LDTN01) = .TRUE.
```

caused the compiler to generate the warning message

ISN --- IEK229I 04 ALL THE ARGUMENTS OF AN ARITHMETIC STATEMENT FUNCTION ARE NOT USED IN THE DEFINITION.

B. Execution

No errors.

FM021

A. Compilation

No errors.

B. Execution

No errors.

FM022

A. Compilation

The compiler issued a message on variable RADN13 which stated "The DATA statement contains a variable that is not referenced".

B. Execution

No errors.

FM023 through FM045, FM050 through FM062, FM080 through FM083, and FM097 through FM099

A. Compilation

No errors.

B. Execution

No errors.

FORTRAN I/O Routines - FM100 through FM108

The I/O routines were executed with the output logical unit assigned to a tape device and rerun with the output logical unit assigned to a mass-storage device.

FM100 through FM103

A. Compilation

The compiler issued a message on the variable NINE which stated "the DATA statement contains a variable that is not referenced".

B. Execution

No errors.

FM104 through FM105

A. Compilation

The compiler issued messages on the variables IZERO and NINE which stated "The DATA statement contains a variable that is not referenced."

B. Execution

No errors.

FM106 through FM108

A. Compilation

The compiler issued a message on the variable NINE which stated "the DATA statement contains a variable that is not referenced."

B. Execution

No errors.

FM109

A. Compilation

No errors.

B. Execution

No errors.